

REMARKS

Claims 16 and 48 are amended. Claims 8 and 10 are cancelled. Claims 9, 14-16, 21 and 47-49 are pending in the application.

Claims 8-10, 14-16, 21 and 48-49 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Wolf "Silicon Processing", pages 40, 52-54 and 555-557; as combined with Ding, U.S. Patent No. 5,814,563; JP 200-349071 (JP '071); and Sugishima, U.S. Patent No. 4,352,724; as further combined with either Lyons, U.S. Patent No. 5,930,645; or May, U.S. Patent No. 5,943,585. The Examiner is reminded by direction to MPEP § 2143 that a proper obviousness rejection has the following three requirements: 1) there must be some suggestion or motivation to modify or combine reference teachings; 2) there must be a reasonable expectation of success; and 3) the combined references must teach or suggest all of the claim limitations. Pending claims 9, 14-16, 21 and 48-49 are allowable over the combinations of Wolf, Ding, JP '071, Sugishima, Lyons and May for at least the reason that the references, individually or as combined, fail to disclose or suggest each and every element in any of those claims or to provide a basis for a reasonable expectation of success.

As amended, independent claim 16 recites etching an opening through a silicon nitride layer, through a layer of oxide material and into a semiconductive material through an opening in a mask, where the etching of the opening is substantially selective relative to photoresist and utilizes a single etch chemistry produced by generating a plasma from a processing gas consisting of ammonia and at least one fluorocarbon selected from the group consisting of CF₄, C₄F₆, C₄F₈, C₂F₆, C₃F₈, C₅F₈, and chlorofluorocarbons. Claim 16 further recites that the etching is conducted substantially anisotropically relative to the

silicon nitride layer. The amendment to claim 16 is supported by the specification at, for example, page 6, line 13 through page 7, line 4.

Wolf discloses different etch conditions utilized for silicon oxide layers, silicon nitride layers and silicon layers. Wolf does not disclose or suggest the claim 16 recited utilizing a single etch chemistry to etch an opening through silicon nitride, through silicon oxide and into a semiconductive material. Further, as acknowledged by the Examiner at page 2 of the present Action, Wolf does not disclose or suggest the recited single etch chemistry comprising ammonia in combination with one or more fluorocarbon selected from the recited group. The Examiner indicates reliance upon Sugishima, May and Lyons for disclosing etching nitride oxide and substrate materials in a single etch. Applicant notes however that Lyons does not disclose or suggest etching a silicon nitride layer and therefore cannot suggest or contribute towards suggesting the claim 16 recited single etch chemistry utilized to etch silicon nitride, oxide material and semiconductive material. The Examiner indicates reliance upon the Sugishima disclosure at column 5, lines 52-59 as disclosing a same etch chemistry for silicon nitride, silicon oxide and silicon. However, when claim 16 is properly considered as a whole, such clearly indicates that the etch is substantially anisotropic relative to silicon nitride, occurs substantially selectively relative to photoresist, and utilizes a single etch chemistry which includes ammonia and fluorocarbons. The portion of Sugishima relied upon by the Examiner specifies isotropic etching. Although Sugishima does indicate some anisotropic etching conditions for various materials (col. 5, ll. 62 through col. 6, ll. 47), nowhere does Sugishima disclose or suggest utilization of a single etch chemistry produced by generating plasma from a processing gas consisting of ammonia and at least one fluorocarbon selected from the recited group to

anisotropically etch silicon nitride. In combination with Wolf, the Sugishima disclosure does not contribute toward suggesting utilization of a single etch chemistry produced by generating a plasma from a processing gas consisting of ammonia and at least one fluorocarbon selected from the recited group to etch an opening through silicon nitride oxide material and semiconductive material.

With respect to May, the Examiner indicates that such discloses etching a nitride layer, silicon oxide layer and substrate in a single dry plasma etch referring to column 7, lines 7-10. Applicant notes that this portion of the May disclosure indicates generally that nitride oxide and substrate layers which are not covered by photoresist may be etched utilizing a dry plasma etch technique. Such does not disclose or suggest any particular etch chemistry capable of etching all three or even indicate use of a single etch chemistry. In combination, Wolf, Lyons, Sugishima and May fail to disclose or suggest the claim 16 recited utilization of a single etch chemistry produced by generating a plasma from a processing gas consisting of ammonia and at least 1 fluorocarbon selected from the recited group to etch an opening through silicon nitride, through oxide material, and into a semiconductive material. Nor does the combination of Wolf, Lyons, Sugishima and May provide a basis for a reasonable expectation of achieving the recited etching an opening through silicon nitride through oxide material and into a semiconductive material using a single etch chemistry where the etching occurs substantially anisotropically relative to silicon nitride and the etch chemistry is produced by generating a plasma from the recited processing gas.

With respect to Ding, such discloses methods of etching a dielectric layer comprising silicon oxide or phosphosilicate glass (col. 3, ll. 54-61). Ding further discloses

that the process gas includes a fluorohydrocarbon gas, an ammonia-generating gas, and a carbon-oxygen gas. Accordingly, Ding does not disclose or suggest the claim 16 recited single etch chemistry produced by generating a plasma from a processing gas consisting of ammonia and at least one fluorocarbon selected from the recited group of fluorocarbons.

Nor does Ding contribute toward suggesting or providing a basis for a reasonable expectation of achieving the claim 16 recited etching through silicon nitride through oxide material and into a semiconductive material utilizing the recited etch chemistry. Accordingly, independent claim 16 is not rendered obvious by the combination of Wolf, Ding, Sugishima, Lyons and May.

As indicated at page 7 of the present Action, JP '071 is relied upon as showing etching of silicon photoresists and silicon nitride using specific fluorocarbons with nitrogen.

However, the '071 disclosure does not suggest the recited single etch chemistry produced by generating plasma from a processing gas consisting of ammonia and at least one fluorocarbon selected from the recited group. Further, the '071 disclosure does not contribute toward suggesting the claim 16 recited etching through silicon nitride oxide material and into a semiconductive material substantially selectively relative to photoresist utilizing the recited etch chemistry. Accordingly, independent claim 16 is not rendered obvious by the combination of Wolf, Ding, Sugishima, Lyons, May and '071 and is allowable over these references.

Dependent claims 8 and 10 are cancelled. Dependent claims 9, 14-15, 21 and 48-49 are allowable over the cited combinations of Wolf, Ding, JP '071, Sugishima, Lyons and May for at least the reason that they depend from allowable base claim 16.

Claim 47 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over a combination of Wolf, Ding, Sugishima, Lyons or May as further combined with Lucent Technologies. As indicated at page 8 of the present Action, Lucent Technologies is relied upon as disclosing a 193 nanometer photoresist. However, the specific photoresist disclosed by Lucent Technologies, when combined with Wolf, Ding, Sugishima, Lyons and May, does not contribute toward suggesting the claim 16 recited etching an opening through silicon nitride through oxide material and into a semiconductive material utilizing a single etch chemistry produced by generating a plasma from a processing gas consisting of ammonia and at least one fluorocarbon selected from the recited group. Accordingly, independent claim 16 is not rendered obvious by the cited combination of Wolf, Ding, Sugishima, Lyons, May and Lucent Technologies and is allowable over these references. Dependent claim 47 is allowable over Wolf, Ding, Sugishima, Lyons, May and Lucent Technology for at least the reason that it depends from allowable base claim 16.

For the reasons discussed above pending claims 9, 14-16, 21 and 47-49 are allowable. Accordingly, applicant respectfully requests formal allowance of such pending claims in the Examiner's next action.

Respectfully submitted,

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